CLAIMS

1. A method of increasing the photoluminescence of an Erbium Oxide thin film at room temperature, comprising:

forming Erbium Oxide molecules by reacting Erbium sputtered atoms with O_2 in a gas phase;

creating the Erbium Oxide thin film by depositing the Erbium Oxide molecules on a substrate coated with Silicon Oxide; and

annealing the Erbium Oxide thin film by utilizing a low temperature treatment for a specified amount of time and temperature followed by a high temperature treatment for another specified amount of time and temperature, wherein said temperature treatments increases crystallinity of the thin film.

2. The method of claim 1, wherein forming Erbium Oxide molecules further includes creating a vacuum.

3. The method of claim 2, wherein the vacuum is an ultra high vacuum of less than $5x10^{-9}$ torr.

4. The method of claim 1, wherein annealing the Erbium Oxide thin film further includes utilizing a furnace.

5. The method of claim 4, wherein the furnace is a conventional tube furnace under O_2 ambient.

6. The method of claim 4, wherein annealing the Erbium Oxide thin film further includes the step of adding oxygen to a lattice of the thin films.

7. The method of claim 4, wherein annealing the Erbium Oxide thin film further includes the step of exposing the thin films to an O_2 overpressure.

8. The method of claim 1, wherein the time and the temperature of the low temperature treatment varies between 2-20 hrs and 600-1050 °C.

9. The method of claim 1, wherein the time and temperature of the high temperature treatment varies between 2-20 hrs. and 600-1050 °C.

10. A process for increasing the photoluminescence of Erbium Oxide thin film at room temperature, comprising the steps of:

forming Erbium Oxide molecules by reacting Erbium sputtered atoms with O_2 in a gas phase;

creating the Erbium Oxide thin film by depositing the Erbium Oxide molecules on a substrate coated with Silicon Oxide; and

annealing the Erbium Oxide thin film by utilizing a low temperature treatment for a specified amount of time and temperature followed by a high temperature treatment for another specified amount of time and temperature, wherein said temperature treatments increases crystallinity of the thin film..

11. The process of claim 10, wherein the step for forming Erbium Oxide molecules further includes the step of creating a vacuum.

12. The process of claim 11, wherein the vacuum is an ultra high vacuum of less than $5x10^{-9}$ torr.

13. The process of claim 10, wherein annealing the Erbium Oxide thin films further includes utilizing a furnace.

14. The process of claim 13, wherein the furnace is a conventional tube furnace under O_2 ambient.

15. The process of claim 13, wherein annealing the Erbium Oxide thin films further includes the step of adding oxygen to a lattice of the thin films.

16. The process of claim 13, wherein annealing the Erbium Oxide thin films further includes the step of exposing the thin films to an O_2 overpressure.

17. The process of claim 10, wherein the low temperature treatment varies between 2-20 hrs and 600-1050 °C.

18. The process of claim 10, wherein the low temperature treatment varies between 2-20 hrs. and 600-1050 °C.

19. A system for producing an Erbium Oxide thin film with increased photoluminescence at room temperature, the system comprises:

a depositing stage for forming Erbium Oxide molecules by reacting Erbium sputtered atoms with O_2 in a gas phase and creating the Erbium Oxide thin film by depositing the Erbium Oxide molecules on a substrate coated with Silicon Oxide; and

an annealing stage for annealing the Erbium Oxide thin film by utilizing a low temperature treatment for a specified amount of time and temperature followed by a high temperature treatment for another specified amount of time and temperature, wherein said temperature treatments increases crystallinity of the thin film.

20. The system of claim 19, wherein the depositing stage creates a vacuum.

21. The system of claim 20, wherein the vacuum is an ultra high vacuum of less than $5x10^{-9}$ torr.

22. The system of claim 19, wherein the annealing stage utilizes a furnace.

23. The system of claim 22, wherein the furnace is a conventional tube furnace under O_2 ambient.

24. The system of claim 22, wherein the annealing stage adds oxygen to a lattice of the thin films.

25. The system of claim 22, wherein the annealing stage exposes the thin film to an O_2 overpressure.

26. The system of claim 19, wherein the low temperature treatment varies between 2-20 hrs and 600-1050 °C.

27. The system of claim 19, wherein the low temperature treatment varies between 2-20 hrs. and 600-1050 °C.